U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Pyrgulopsis thompsoni

Common Name:

Huachuca springsnail

Lead region:

Region 2 (Southwest Region)

Information current as of:

05/30/2013

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

> ___ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status
>
> ___ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species
>
> ___ Range is no longer a U.S. territory
>
> ___ Insufficient information exists on biological vulnerability and threats to support listing
>
> ___ Taxon mistakenly included in past notice of review
>
> ___ Taxon does not meet the definition of "species"
>
> ___ Taxon believed to be extinct
>
> ___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Arizona
- **US Counties**:County information not available
- **Countries**: Mexico

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Arizona
- **US Counties**: Cochise, AZ, Santa Cruz, AZ
- **Countries**: Mexico

Land Ownership:

In the United States, 79 percent Federal (Fort Huachuca (Fort), Bureau of Land Management (BLM), and Coronado National Forest (CNF)) and 21 percent private. In Mexico, unknown, though likely 100 percent private. We estimate approximately 15 acres (6 hectares) of total habitat on Federal and private land.

Lead Region Contact:

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Biological Information

Species Description:

The Huachuca springsnail is a moderate to large-sized snail with a shell height of 0.07 to 0.13 inches (1.7 to 3.2 millimeters) (Hershler and Landye 1988, pp. 41-43). The shell is moderately convex with slightly shouldered whorls. The inner lip of the shell is thin. The aperture is fused to or separate from body whorl. The umbilicus is chink-like or open.

Taxonomy:

The Huachuca springsnail is a member of the family Hydrobiidae (Phylum Mollusca; Class Gastropoda; Subclass Prosobranchia). It is one of approximately 170 known species of Hydrobiid snails in the United States. It was originally identified by Landye (1973, p. 25), and Bequart and Miller (1973, pp. 213-214) in the genus Fontelicella from specimens collected at Peterson Ranch Spring (a.k.a. Sylvania Spring or Scotia Canyon Spring), and Monkey Spring, in Santa Cruz and Cochise Counties, Arizona. Landye (1981, p. 28) treated populations from Canelo Hills Cienega, Monkey Spring, and Sheehy Spring as three separate Fontelicella species. These populations were synonomized (categorized as the same species) and the species was fully described by Hershler and Landye (1988, pp. 41-43) as Pyrgulopsis thompsoni from specimens examined from Cottonwood Spring, Monkey Spring, Canelo Hills Cienega, Sheehy Spring, and Peterson Ranch Spring, Santa Cruz County, Arizona; and from Ojo Caliente, Sonora, Mexico. We have carefully reviewed the available taxonomic information and conclude that P. thompsoni is a valid taxon. Importantly, relatively recent taxonomic research indicates significant genetic divergence within this species, with four evolutionarily significant units (ESUs) identified among nine populations examined (Hurt and Hedrick 2004, p. 411; Hurt 2004, p. 1184). Two ESUs comprise populations on the east and west slopes of the Huachuca Mountains, while two ESUs are represented by Cottonwood Spring and Monkey Spring (Hurt and Hedrick 2004, p. 411). Populations at lower elevations along Sonoita Creek and in the San Rafael Valley possess all unique alleles with large genetic distances from other conspecific haplotypes, while the Monkey Spring population is both genetically and environmentally unique (Hurt 2004, p. 1184). At minimum this information seems to suggest taxonomic uncertainty within the larger complex referred to as Huachuca springsnail, and possibly taxonomic differentiation. No further work has been done regarding the taxonomy of the Huachuca springsnail populations, and until further information is received we consider all currently identified sites to be Huachuca springsnail.

Habitat/Life History:

In the arid Southwest, snails of the family Hydrobiidae are largely relicts of the wetter Pleistocene Age (1.6 million 10,000 years ago) and are typically distributed across the landscape as geographically isolated populations exhibiting a high degree of endemism (found only in a particular area or region) (Bequart and Miller 1973, p. 214; Taylor 1987, pp. 5-6; Shepard 1993, p. 354; Hershler and Sada 2002, p. 255). Springsnails are strictly aquatic and respiration occurs through an internal gill. Springsnails in the genus Pyrgulopsis are egg-layers (Hershler 1998, p. 14). The larval stage is completed in the egg capsule and upon hatching, tiny snails emerge into their adult habitat (Brusca and Brusca 1990, p. 759; Hershler and Sada 2002, p. 256). The sexes are separate and physical differences are noticeable between them, with females being larger than males. Mobility is limited and significant migration likely does not occur, although aquatic snails have been known to disperse by becoming attached to the feathers of migratory birds (Roscoe 1955, p. 66; Dundee et al. 1967, pp. 89-90).

Hydrobiid snails feed primarily on periphyton, which is a complex mixture of algae, bacteria, microbes, and detritus that live upon submerged surfaces in aquatic environments (Mladenka 1992, pp. 46, 81; Hershler and Sada 2002, p. 256; Lysne et al. 2007, p. 649). The life span of most aquatic snails is 9 to 15 months (Pennak 1989, p. 552). Predators of springsnails include waterfowl, shorebirds, amphibians, fishes, crayfish, leeches, and aquatic insects. Limited information on disease or parasites in springsnails is available, though aquatic snails can serve as intermediate hosts for trematodes (parasitic flatworms) (Dillon 2000, p. 227; Schmidt and Roberts 2000, p. 1).

Hydrobiid snails occur in springs, seeps, marshes, spring pools, outflows, and diverse lotic (flowing) waters. The most common habitat for the Huachuca springsnail is a rheocrene ecosystem (water emerging from the ground as a flowing stream). However, some sites are spring-fed aquatic climax communities commonly described as ciénegas (marshes) (Hendrickson and Minckley 1984, pp. 133-134). Substrate is typically firm and characterized by cobble, gravel, woody debris, and aquatic vegetation. These substrate types provide suitable surfaces for grazing and egg laying (Taylor 1987, p. 5; Hershler 1998, p. 14). Pyrgulopsis species are rarely found on or in soft sediment (Hershler 1998, p. 14). They are typically found more often, and in greater abundance, in gravel to cobble size substrates (Frest and Johannes 1995, p. 203; Malcom et al. 2005, p. 75; Martinez and Thome 2006, pp. 12-13; Lysne et al. 2007, p. 650; Martinez and Myers 2008, p. 191). The habitat of the Huachuca springsnail is characterized by various aquatic and emergent plant species that occur within plains grassland, oak and pine-oak woodlands, and coniferous forest vegetation communities within the Huachuca Mountains and the San Rafael Valley. The species is typically found in the shallower areas of springs, often in gravelly seeps at the spring source.

Proximity to spring vents, where water emerges from the ground, plays a key role in the life history of springsnails. Many springsnail species exhibit decreased abundance farther away from spring vents, presumably due to their need for stable water chemistry and flow regime provided by spring waters (Hershler 1984, p. 68; Hershler 1998, p. 11; Hershler and Sada 2002, p. 256; and Martinez and Thome 2006, p. 14). Several habitat parameters of springs, such as substrate, dissolved carbon dioxide, dissolved oxygen, temperature, conductivity, and water depth, have been shown to influence the distribution and abundance of Pyrgulopsis snails (OBrien and Blinn 1999, pp. 231-232; Mladenka and Minshall 2001, pp. 209-211; Malcom et al. 2005, p. 75; Martinez and Thome 2006. pp. 12-15; Lysne et al. 2007, p. 650; Martinez and Myers 2008, p. 191-192). Dissolved salt may also be an important factor, because it is essential for shell formation (Pennak 1989, p. 552). Tsai et al. (2007, pp. 215-216) found that Huachuca springsnail were present in sites characterized by cooler (18.4±2.1 °C, 65.1+3.8 °F), more oxygenated (5.44±0.86 mg/L dissolved oxygen), and less turbid (261.68±42.4 total dissolved solids) spring water.

Based on our current knowledge, important habitat elements appear to include: 1) permanent free-flowing springs; 2) shallow, unpolluted water; 3) coarse firm substrates such as pebble, gravel, cobble, and woody debris; and 4) native aquatic macrophytes, algae, and periphyton.

Historical Range/Distribution:

Based on information in our files, there is no documentation of extirpation of Huachuca springsnail from any known locality. Although loss of ciénegas during the last century in southeastern Arizona is well-documented (Hendrickson and Minckley 1984, p. 131), we do not know whether any other losses of springs resulted in the loss of any population of Huachuca springsnail.

The original description of the species by Hershler and Landye (1988, p. 41) examined specimens from five sites in Santa Cruz County, Arizona (Cottonwood Spring, Monkey Spring, Canelo Hills Ciénega, Sheehy Spring, and Peterson Ranch Spring), and from one site in Sonora, Mexico (Ojo Caliente). The range of the species has subsequently been expanded to include several other sites where the species has been located by various researchers and agency personnel. Landye (1999, pp. 1-2) lists 15 spring localities from which the

species has been known: Garden Canyon (two distinct springs), Huachuca Canyon (two distinct springs), McClure Spring, Broken Pipe Spring, Cave Spring, Sawmill Spring, and Blacktail Spring on the Fort; Scotia Canyon/Peterson Ranch Spring, Monkey Spring, Cottonwood Spring, Sheehy Spring, and Canelo Hills Cienega on private lands; and Ojo Caliente on private land in Mexico.

Current Range Distribution:

Landye (1995, p. 1) indicates that sites with hydrobiid snails discussed by Frest (1993, p. 1) are Huachuca springsnail and include Conger Creek, Cienega Creek, Ramsey Canyon, Redfield Canyon, and Wet Beaver Creek. Landye (1999, p. 1) also listed other potential, but unconfirmed, sites including Mattie Canyon and Tombstone Reservoir. The U.S. Fish and Wildlife Service (Service) (1995, p. 4) lists most of the same sites mentioned above, but recognized two other sites on the CNF, Sylvania Spring and Tombstone Reservoir. The Arizona Game and Fish Department (AGFD) (2003, p. 2) lists 13 sites: Monkey Canyon, Sonoita Creek, Santa Cruz River, Canelo Hills Cienega, Scotia Canyon, Garden Canyon, McClure Canyon, Sawmill Canyon, Huachuca Canyon, Blacktail Canyon, Ramsey Canyon, Cienega Creek, and Redfield Canyon. Varela-Romero et al. (1992, p.1) reported the species from Cienega Los Fresnos in Sonora, Mexico. During field sampling for genetic analysis and habitat studies, Hurt (2004, p. 12) sampled nine sites (Bear, Canelo Hills, Cottonwood, McClure, Garden, Cave, Monkey, Peterson Ranch, and Sawmill) and Tsai et al. (2007, p. 214) sampled eight sites (Garden Canyon, McClure, Cave Spring 1 and 2, Sawmill Spring, Huachuca Spring 1, 2, and 3, all of which appear to overlap with sites previously identified.

The discrepancy in the number of sites presented by various authors likely reflects confusion over names and locations of springs, with some springs having multiple names and vague location descriptions. A recent synthesis of this information indicates the species has been reported from at least 21 sites in Arizona and Sonora, Mexico (Myers 2012, pp. 2, 27-30; Myers 2010, pp. 1-2).

In late June 2012, AGFD biologists conducted a baseline inventory and timed presence-absence survey of 17 Huachuca springsnail sites identified in the Myers (2012) report. The findings from this survey are documented in a July 2012 AGFD report (Piorkowski and Mulligan, 2012). Springsnails were found at 9 of the 17 sites visited; voucher specimens were collected at each site to aid in verifying their identity. Of the sampled sites, only BS01 (previously known as Bear Spring) and GC02 (previously known as Garden Canyon Broken Pipe and/or Garden Canyon Sandbox) contained high counts of live springsnails (>100 individuals within a 10-minute search) (Piorkowski and Mulligan, 2012).

Population Estimates/Status:

Populations of Huachuca springsnails are limited to small sites that are separated by many miles. Actual or estimated population sizes are unknown. However, Tsai et al. (2007, p. 216) recorded a total of 7,276 individual springsnails in June and July of 2003, among seven spring channels.

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

The Huachuca springsnail is potentially threatened by habitat modification and loss through severe wildfire and grazing. As discussed above, springsnails prefer habitats in close proximity to spring vents, dominated by large to medium-sized substrates and appropriate spring water quality (temperature, oxygenation and turbidity). Habitat modification can cause changes in substrate composition or water quality parameters that are outside of those used by the species, resulting in reduced fecundity (capacity for reproduction),

recruitment (influx of new adults to a population through reproduction), and population viability, and an increased risk of population extirpation. The significance of habitat modification for springsnails is reflected in Hershler and Williams (1996, p. 1), who recommend that efforts to maintain springsnail populations focus on maintenance of natural springhead integrity. Therefore, any activities which alter substrate composition or degrade water quality would likely adversely affect the Huachuca springsnail.

Wildfire and Suppression

A potential threat to the Huachuca springsnail is severe wildfire. Fire frequency and intensities in southwestern forests are much altered from historical conditions (Dahms and Geils 1997, pp. 34-35). Before 1900, surface fires generally occurred at least once per decade in montane forests with a pine component. Beginning about 1870-1900, these frequent ground fires ceased to occur due to intensive livestock grazing that removed fine fuels coupled with effective fire suppression in the mid to late 20th century that prevented frequent, widespread ground fires (Swetnam and Baisan 1996, pp. 20-25). Absence of ground fires allowed a buildup of woody fuels that precipitated infrequent but intense crown fires (Danzer et al. 1997, pp. 30-33). Lack of vegetation and forest litter following intense crown fires exposed soils to surface erosion during storms, often causing high peak flows, sedimentation, and erosion in downstream drainages (DeBano and Neary 1996, pp. 70-75).

While the general condition of forests and watersheds is a concern, site-specific information regarding fuel-load conditions at springs occupied by Huachuca springsnail is limited. The U.S. Army (2006, pp. 239-240) believes that fire is a threat to the species because watershed conditions could result in catastrophic fire on the Fort, particularly Garden Canyon which is primed for a severe fire due to relatively dense fuels. Three populations of Huachuca springsnail on the east slope of the Huachuca Mountains (Garden Canyon on the Fort) are fixed for a divergent haplotype (Hurt 2004, p. 1184). The loss of these sites (McClure Spring, Garden Spring and Huachuca Cave Spring) could reduce the overall genetic variability within the Huachuca springsnail taxonomic complex.

A fire in occupied springsnail habitat could conceivably affect a population through habitat modification in the form of sedimentation and erosion caused by spring banks destabilized by the loss of vegetation. Among the southeastern Arizona sky island mountain ranges, the Huachuca Mountains and surrounding areas have been relatively hard hit by recent severe wildfire (Table 2). Most of these fires have burned in the southern portions of the mountain range. The Fort established numerous fire breaks on ridgelines and between the grasslands and the mountains, which keeps the size of wildfires there relatively small.

Table 1: Major wildfires from 1977 to 2006 within Southeastern Arizona. Only fires of 1000/405 acres/hectares or more are listed. Small fires, often no more than an acre or two, are not uncommon, but are typically suppressed rapidly or burn out on their own.

During the 2011 fire season, the Tombstone Reservoir site was affected by wildfire and post-fire flooding (Gerhart 2012, p. 1). The species response and status is unknown due to lack of surveys. Although some researchers (Lang 2002, pp. 5-7; NMDGF 2006, p. 9) have noted lower densities of a springsnail congener (within the same genus) following fire-induced habitat changes, other researchers (Sada and Vinyard 2002, p. 282) have noted the presence of large populations of a different springsnail species in recently burned springs. Without site-specific information, we are unable to fully assess the effect of this fire on Huachuca springsnail at Tombstone Reservoir. Additionally, Scotia Canyon (Peterson Ranch Springs) has not burned in recent years, and could burn severely. Recently, wetland restoration work was implemented at this site to remove bullfrogs to accommodate reestablishment of Chiricahua leopard frog. However, no fuels reduction work has been implemented and the area is still at risk of severe wildfire.

Contamination from aerial fire retardant is a potential threat to the species. Millions of gallons of fire retardants and suppressants are broadly applied aerially, and from the ground, to control wildfires in the western United States each year. Contamination of aquatic sites could potentially occur via direct application, or runoff from treated uplands. These chemicals are ammonia-based, which are potentially toxic; additionally, many formulations also contain the chemical yellow prussiate of soda (i.e. sodium ferrocyanide), which is added as an anticorrosive agent. Such formulations can kill a variety of aquatic and other organisms. Toxicity of these formulations is typically found to be low in the laboratory, but in the field toxicity to aquatic life has been found to be photoenhanced by ambient ultraviolet radiation (Calfee and Little 2003, p. 1529-1533). It is suspected that an errant fire retardant drop was responsible for the extirpation of the Three Forks springsnail (Pyrgulopsis trivalis), a closely related species, from several springs in east-central Arizona (76 FR 20464; April 12, 2011). However, to our knowledge, no Huachuca springsnail sites have been affected by fire retardant.

Livestock Grazing

Additionally, occupied springsnail sites may potentially be threatened by improper livestock grazing. Excessive livestock grazing on spring ecosystems can alter or remove springsnail habitat and limit the distribution of springsnails, or result in extirpation of springsnails (see Bruce and White 1998, pp. 3-4; Arritt 1998, p. 10; NMDGF 2006, p. 13). Grazing can affect springsnails directly through trampling and indirectly through habitat degradation by denuding vegetation and affecting water quality. Livestock grazing currently occurs on the CNF, but is excluded entirely from the Fort and at least one site on BLM land. Although four sites, representing 21 percent of the species range in the U.S. occur on Forest Service lands where livestock grazing is a managed activity, we have no site-specific information to determine the magnitude and imminence of this threat on the species.

Other Stressors

Groundwater depletion has been implicated in the decline of other freshwater mollusks (Landye 1973, p. 1; Landye 1981, p. 1; 70 FR 46304; August 9, 2005). However, we have no specific information regarding the threat of groundwater depletion on habitats of the Huachuca springsnail. Additionally, we have no specific information regarding threats from recreation, timber harvest, or drought.

Summary

In summary, we find the Huachuca springsnail is potentially threatened by habitat loss and modification that could result from severe wildfire and excessive grazing. Although we lack detailed information on the

intensity and frequency of these activities in occupied Huachuca springsnail habitat, we believe they are substantial enough to threaten the species throughout its entire range in the foreseeable future.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

There are a limited number of researchers that study springsnails, and they are usually sensitive to their rarity and endemism. Consequently, collection for scientific or educational purposes is very limited. The Huachuca springsnail has been subjected to a limited number of scientific studies and collections intended to determine taxonomy, distribution, and habitat use. Although sampling-without-replacement can reduce population size of spring-dependent invertebrates, including springsnails (Martinez and Sorensen 2007, p. 29), studies conducted on Huachuca springsnail have not resulted in the removal of large numbers of springsnails and are not believed to have had any negative effect on the species. The species is not known to be utilized for commercial or recreational purposes. Therefore, this is not known to be a factor threatening the Huachuca springsnail.

C. Disease or predation:

The threat from disease or predation to the Huachuca springsnail has not been investigated. However, springsnails and other mollusks are known to serve as the intermediate hosts for a variety of trematodes and as prey for nonnative fish (Raisenen 1991, p. 71) and crayfish (Fernandez and Rosen 1996, pp. 24-25). Although nonnative fish and crayfish are widespread in aquatic systems across Arizona, we have limited information indicating their co-occurrence with Huachuca springsnail. Crayfish are known to occur in Garden Canyon and Blacktail Canyon (S. Stone, 2012, pers. comm.), but we dont know if they have invaded springs. At this time, disease or predation does not appear to be a factor threatening the Huachuca springsnail.

D. The inadequacy of existing regulatory mechanisms:

The Huachuca springsnail is protected by Arizona Game and Fish Commission Order 42 for Crustaceans and Mollusks, which establishes a closed season for the species. This rule prohibits collection and harvest, but does not protect against habitat modification like fire or unmanaged grazing. The Huachuca springsnail is identified as a Species of Greatest Conservation Need (tier 1a) in the Arizona State Wildlife Action Plan prepared by the AGFD. This plan helps guide the AGFD and other agencies in determining what biotic resources should receive priority management consideration. However, conservation benefits would mostly come from proactive initiatives because this plan has no legal regulatory authority.

The species is afforded some regulatory protection by occurring with or near other federally listed species, such as the Huachuca water umbel (Lilaeopsis schaffneriana ssp. recurva) in Garden Canyon. Federal actions affecting listed species require consultation under section 7 of the Endangered Species Act and potentially provide benefits to the Huachuca springsnail.

In 2001, the U.S. Army finalized the Fort Huachuca Integrated Natural Resources Management Plan (INRMP) that provides guidance on land use, military training operations, and conservation of wildlife and their habitat on the fort (U.S. Army 2001, entire). The INRMP provides for inventory of remote springs, monitoring of known occupied sites as needed, general protection of springs, and development of a conservation agreement, (U.S. Army 2001, pp. 111, 145). As discussed above, the primary threat to Huachuca springsnail on the Fort is wildfire. The INRMP contains several goals and objectives related to fire management. These include the collection of fire history data, fire mapping, fuel hazard reduction, and prescribed fire to reduce the risk of stand-replacing fire (U.S. Army 2001, pp. 114, 120-121). To this point, actions implemented near springsnail habitats are: 1) silt fencing along Garden Canyon, between the road shoulder and creek banks; and 2) thinning of shrubs and small trees along the road through Garden Canyon

up to the junction with Sawmill Canyon (~6,200 ft (1890 m) elev) to slow the spread, and lower the intensity, of the Monument Fire in 2011 (Stone 2012, p. 1). We have no additional information regarding the status of these goals and objectives as they relate to site-specific conditions at springsnail sites on the Fort. The best available information indicates that high fuel loads continue to threaten Huachuca springsnail habitats with severe fire on the Fort.

Livestock grazing is restricted in Redfield Canyon Wilderness (Gerhart and Blasius 2012, pp. 1-2), providing protection to Huachuca springsnails at Redfield Canyon from livestock grazing. We have no additional information indicating that other sites on CNF or BLM lands are protected from livestock grazing.
The Guidelines for Aerial Delivery of Retardant or Foam Near Waterways directs fire-fighting operations to avoid the application of retardant chemicals within 300 feet of waterways. However, these guidelines do not always prevent delivery of retardant to waterways and spring ecosystems. Additionally, the CNF and BLM, in coordination with the Nature Conservancy, have plans in place to reduce the possibility of catastrophic wildfire (Gerhart and Blasius 2012, pp. 1-2). However, we are unable to evaluate the effectiveness of these fire plans without site-specific information regarding how conservation efforts under the plans have protected sites occupied by the species. Although surely beneficial, the available information does not indicate the extent that these plans reduce the threat of severe wildfire.

Based on our review of the available information, existing regulatory mechanisms appear inadequate to protect the species from potential habitat modification.

E. Other natural or manmade factors affecting its continued existence:

Periods of drought in the Southwest are not uncommon; however, the frequency and duration of dry periods may become more frequent by future climate change. Global climate change and associated effects on regional climatic regimes are not fully known, but the predictions for the Southwest indicate less overall precipitation and longer periods of drought. Seager et al. (2007, p. 1181) predict, based on broad consensus among 19 climate models, that the Southwest will become drier in the 21st century and that the transition to this drier state is already underway. The increased aridity associated with the current ongoing drought will become the norm for the Southwest within a timeframe of years to decades, if the models are correct. Perhaps this species, along with its habitat (see Bagne and Finch 2010, entire), may eventually be affected in some manner by climate change, but the magnitude and extent of possible change cannot be verified or quantified at this time.

We have no information regarding other natural or manmade factors that appear to be a threat to Huachuca springsnail.

Conservation Measures Planned or Implemented :

The Huachuca springsnail is part of the recent Multi-District Litigation Settlement Agreement related to the Services listing workplan. Under the agreement, a proposed rule or candidate withdrawal is due by 2016. Consequently, an interagency meeting was held in March 2012 to discuss initiation of an interagency effort to develop a Candidate Conservation Agreement (CCA). The Fort has expressed an interest in entering into a CCA with the Service and AGFD. AGFD has indicated their intention to take lead for development of a draft CCA, and created an initial draft of this agreement in July 2012. AGFDs species lead (Sorensen) is making additional edits to the draft agreement before forwarding it to cooperators for their review and input. Cooperators will explore the potential to acquire a Legacy Grant through Department of Defense, a Heritage Grant through AGFD, or Science Support Partnership funding through the Service and the U.S. Geological Survey (USGS) to answer outstanding taxonomic questions. In late 2012, AGFD submitted a springsnail project proposal for the Legacy Grant Program, which includes further investigations and surveys for the Huachuca springsnail; the funding of the proposal is still pending (Jeff Sorensen, AGFD, pers. comm.).

Summary of Threats :

Habitat modification from wildfire and livestock grazing (FactorA), and the inadequacy of regulatory mechanisms (Factor D) are potential threats to the species. Degradation of ciénegas in the Southwest has occurred, and the information we have regarding potential threats leads us to believe that habitat loss could eventually affect the springsnail. Accordingly, we find that the Huachuca springsnail is threatened throughout all of its range in the foreseeable future, and, therefore, find that it is unnecessary to analyze whether it is threatened in a significant portion of its range.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

The following conservation measures have been identified: map the current landscape distribution with GIS and further define habitat characteristics; conduct genetic work to clarify the taxonomic relationship between and among all occupied sites; assess threats at finer landscape scales; develop conservation measures to protect habitat; and monitor the species through a comprehensive CCA.

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	Imminent	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-imminent	Monotypic genus	10
		Species	**11**
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

At the landscape scale, all of the springs in which the species is found could be affected by severe wildfire, and a portion could be affected by livestock grazing. However, because these threats are not occurring throughout the range of the species uniformly and not all populations would likely be impacted simultaneously by any of the known threats, we find the magnitude of threats across the range to be low.

Imminence :

Wildfire could potentially occur across the entire range of the species, and livestock grazing across a portion of the range. However, we have no site-specific information indicating that these threats are causing current or ongoing detrimental effects within habitats occupied by the species. Therefore, we conclude that threats to this species are non-imminent.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

There are 21 to 27 populations that are subject to non-imminent threats of low magnitude.

Description of Monitoring:

We are unaware of any ongoing monitoring, with the exception of the 2012 surveys conducted by AGFD. We have collaborated with USGS through the University of Arizona Cooperative Research Unit since 2010 to try to secure funding for a genetic study aimed at clarifying the phylogenetic relationships of all springsnail populations currently identified as Huachuca springsnail. However, the proposal has not been funded.

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Arizona

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

Literature Cited:

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Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  05/21/2013
Date

Concur:  10/28/2013
Date

Did not concur: _____ _____
Date

Director's Remarks: